

Idaho National Engineering and Environmental Laboratory

Environmental Management Science Program (EMSP) for Deactivation and Decommissioning

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Environmental Management Science Program (EMSP)

- *Established in 1996*
- *Mandate from Congress to*
 - *“Provide sufficient attention and resources to longer-term basic science research which needs to be done to ultimately reduce clean-up costs....develop a program that takes advantage of laboratory and university expertise, and ...seek new and innovative clean-up methods to replace current conventional approaches which are often costly and ineffective.”*

EMSP Mission

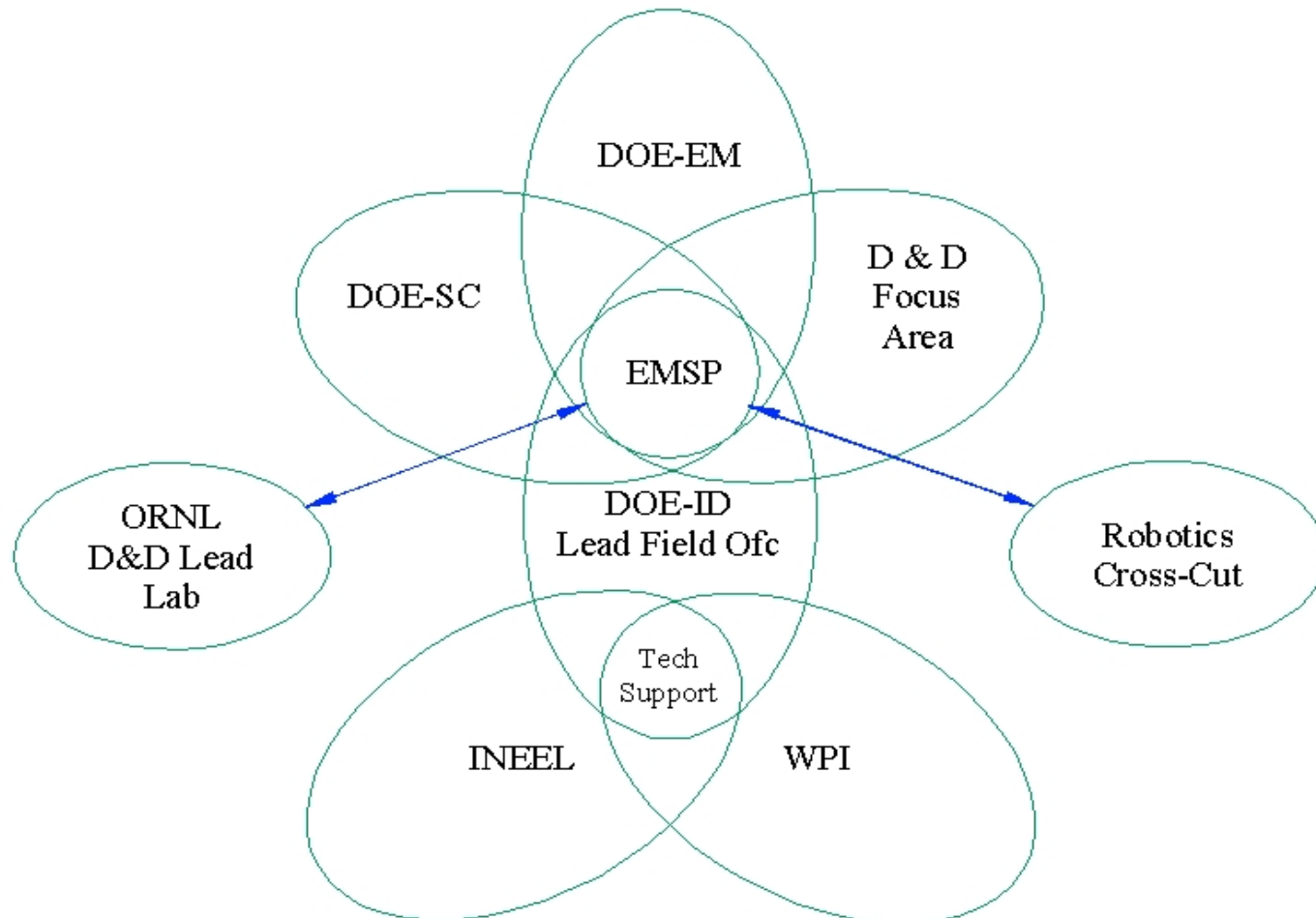
- *Develop and fund targeted, long-term research*
- *Result in breakthrough approaches to solve D&D problems*
- *Lead to reduced cost, schedule, and risk*



EMSP Supports Significant DOE Activities

- *High Level Waste (Tanks)*
- *Mixed Waste*
- *Subsurface Contamination*
- *Deactivation and Decommissioning (D&D)*
- *Spent Nuclear Fuel*
- *Nuclear Materials*
- *Health/Ecology/Risk*

Organization



EMSP Research is Relevant to DOE D&D Problems

- *Baseline technologies are not ideal*
- *New methods needed to complete D&D safer, faster, and more cost effectively*
- *Long-term research needed to develop new technologies and methods*
- *Need to start development now to meet clean-up milestones*

EMSP Research is Relevant to DOE's D&D Needs

- *Documented needs are the basis for EMSP solicitations*
- *Site Technology Coordination Group (STCG) Needs*
- *Complex-wide needs identified by National Academy of Science (NAS)*

EMSP Technical Approach

- *Review documented needs*
- *Send solicitations directed at selected needs*
- *Award research grants*
- *Liaison between researchers and needs holders to help transition research into field applications*

DOE's D&D Needs

- *181 STCG individual science and technology needs*
- *263 total if robotics needs are included*
- *National Academy of Science 2001 study identified four basic D&D need areas*
 - *Characterization*
 - *Decontamination*
 - *Remote Systems*
 - *End State Definition*

Improved Characterization of Contaminated Materials



Decontamination of Equipment and Facilities



Remote Intelligent Systems to Improve Worker Safety



End State Definition for Facility D&D



Project complete.

Transitioning New Technologies to Field Applications

- *This task is surprisingly difficult*
- *Researchers do not understand D&D needs and do not have contacts at DOE sites*
- *Research results are not mature enough or ready to be easily transferred to the field*



EMSP Technical Leads Aid with Transition of Technologies to Field

- *Liaison between researchers and need holders*
 - *Help researchers understand actual needs*
 - *Focus their attention on end result of research*
- *Set up and coordinate field demonstrations of ESMP technologies*
- *Help research projects result in useful, practical products for use in D&D operations*

EMSP Benefits to DOE

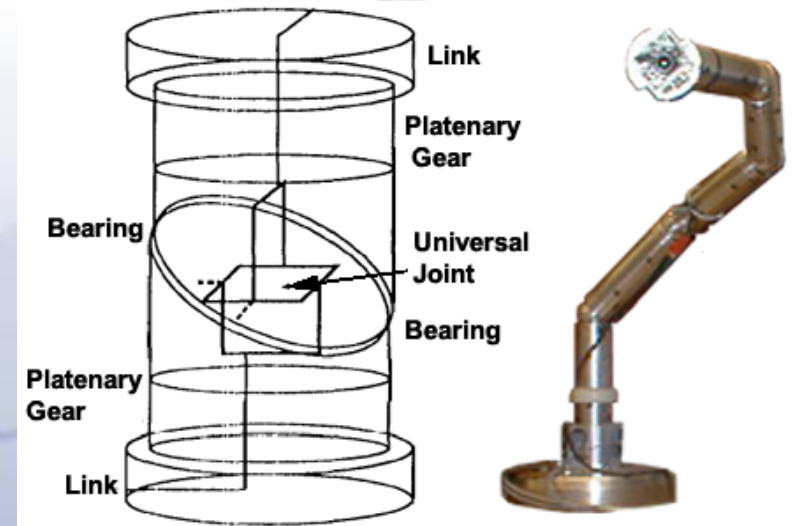
- *Cost effective, safer technologies*
- *Faster technology development program*
- *DOE Field Office with lots of D&D experience is coordinating program*
- *Standard guide on technology development is being written by INEEL*
- *DOE clean-up milestones can be met*

EMSP Technical Progress

- *Solicited 2001 D&D proposals*
- *Awarded 13 research grants that address D&D need areas defined by NAS*
 - *Five support characterization*
 - *Three focus on decontamination*
 - *Five address robotics issues*
- *Held kick-off workshop (ORNL)*

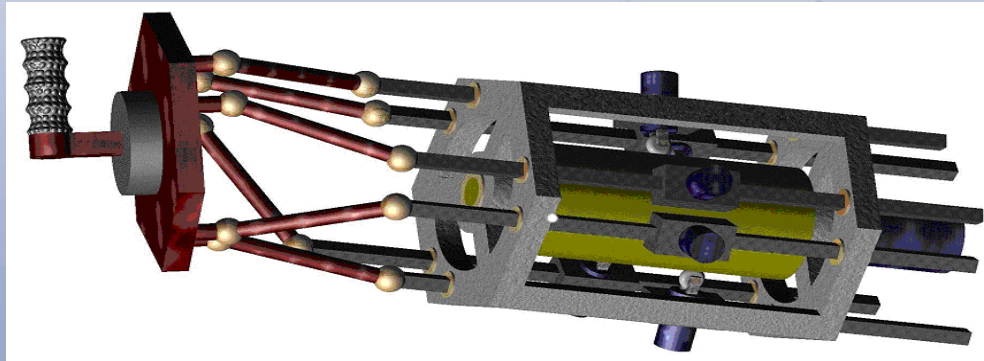
EMSP D&D Projects

- *Design and Sensor-Based Control for Hyper-Redundant Mechanisms*
- *Hybrid Actuators for Enhanced Automation in D&D Systems Tasks*
- *Multi-Optimization Criteria-Based Robot Behavioral Adaptability and Motion Planning*



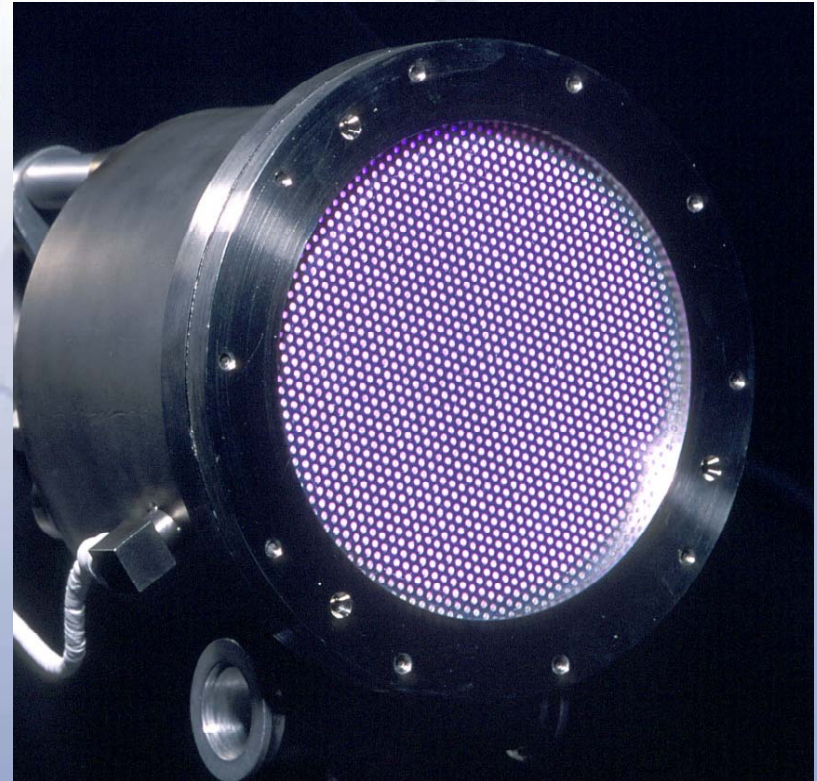
EMSP D&D Projects

- *Image-Based Visual Servoing for Robotic Systems: A Nonlinear Lyapunov-Based Control Approach*
- *Remote Manipulation for Deactivation and Decommissioning Exhibiting Tele-Autonomy and Tele-Collaboration*



EMSP D&D Projects

- *Atmospheric Pressure Plasma Cleaning of Contaminated Surfaces*
- *Innovative Laser Ablation Technology for Surface Decontamination*



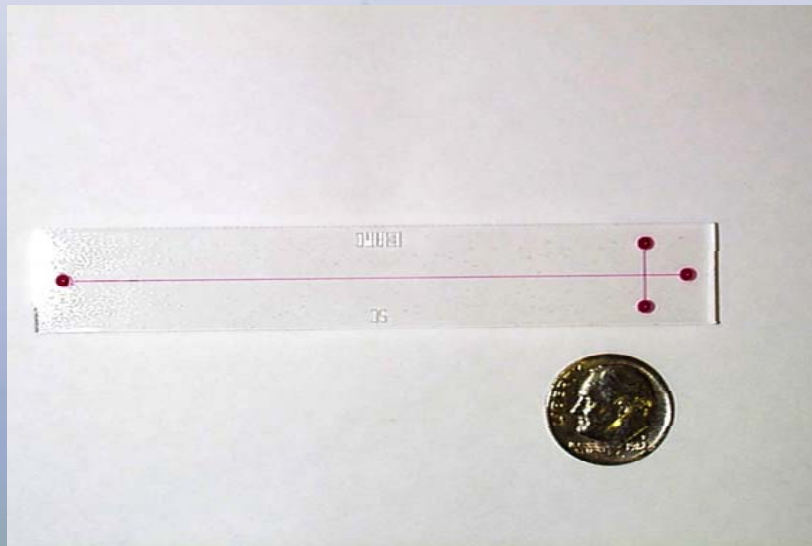
EMSP D&D Projects

- *Physico-Chemical Dynamics of Nanoparticle Formation during Laser Decontamination and Characterization*
- *Development of Biodegradable Isosaccharinate Containing Foams for Decontamination of Actinides: Thermodynamic and Kinetic Reactions between Isosaccharinate and Actinides on Metal and Concrete Surfaces*



EMSP D&D Projects

- *Bio-Chemo-Opto-Mechanical (BioCOM) Sensors for Real-Time Characterization*
- *Field Portable Microchip Analyzer for Airborne and Surface Toxic Metal Contaminants*



EMSP D&D Projects

- *Contaminant-Organic Complexes: Their Structure and Energetics in Surface Decontamination Processes*
- *Alternative Ionization Methods for Particle Mass Spectrometry*
- *Assessing the State and Distribution of Radionuclide Contaminants in Concrete: An Experimental and Modeling Study of the Dynamics of Contamination*

EMSP Contacts and Website

- *EMSP Contacts*
 - *Mark Gilbertson, Director, Office of Basic and Applied Research, (202) 586-7150, Mark.Gilbertson@em.doe.gov*
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- *EMSP Website: <http://emsp.em.doe.gov/>*

Conclusions

- *Facility clean up commitments require improved technologies*
- *EMSP is helping develop technologies to reduce cost, schedule, and risk*

